

## 510(K) SUMMARY

**SUBMITTED BY:** Becton, Dickinson and Company  
7 Loveton Circle  
Sparks, MD 21152  
Phone: (410) 316 - 4278  
Fax: 410-316-4499

**CONTACT NAME:** Monica E Giguere  
Regulatory Affairs Specialist

**DATE PREPARED:** March 30, 2006

**DEVICE TRADE NAME:** BD Phoenix™ Automated Microbiology System –  
Cefepime-0.5-64 µg/mL and Ceftriaxone-0.5-64 µg/mL,

**DEVICE COMMON NAME:** Antimicrobial susceptibility test system-short incubation

**DEVICE CLASSIFICATION:** Fully Automated Short-Term Incubation Cycle Antimicrobial  
Susceptibility Device, 21 CFR 866.1645

**PREDICATE DEVICES:** VITEK® System (PMA No. N50510) and BD Phoenix™  
Automated Microbiology System with Gatifloxacin (K020321,  
May 23, 2002), Cefepime-0.5-64 µg/mL (K032675, March 1,  
2004) and Ceftriaxone -0.5-64 µg/mL (K032655,  
October 6, 2003)

**INTENDED USE:** The BD Phoenix™ Automated Microbiology System is  
intended for the rapid identification and *in vitro* antimicrobial  
susceptibility testing of isolates from pure culture of most  
aerobic and facultative anaerobic Gram-negative and Gram-  
positive bacteria of human origin.

### DEVICE DESCRIPTION:

The BD Phoenix Automated Microbiology System (Phoenix System) is an automated system for the rapid identification (ID) and antimicrobial susceptibility testing (AST) of clinically relevant bacterial isolates. The system includes the following components:

- BD Phoenix instrument and software.
- BD Phoenix panels containing biochemicals for organism ID testing and antimicrobial agents for AST determinations.
- BD Phoenix ID Broth used for performing ID tests and preparing AST Broth inoculum.
- BD Phoenix AST Broth used for performing AST tests only.

- BD Phoenix AST Indicator solution added to the AST Broth to aid in bacterial growth determination.

The Phoenix AST method is a broth based microdilution test. The Phoenix System utilizes a redox indicator for the detection of organism growth in the presence of an antimicrobial agent. Measurements of changes to the indicator as well as bacterial turbidity are used in the determination of bacterial growth. Each AST panel configuration contains several antimicrobial agents with a wide range of two-fold doubling dilution concentrations.

The Phoenix panel is a sealed and self-inoculating molded polystyrene tray with 136 micro-wells containing dried reagents. Organisms for susceptibility testing must be a pure culture and preliminarily identified as a Gram-negative or Gram-positive isolate. Phoenix panels are inoculated with a specified organism density and placed into the instrument.

The instrument houses the panels where they are continuously incubated at a nominal temperature of 35°C. The instrument takes readings of the panels every 20 minutes. The readings are interpreted to give an identification of the isolate, minimum inhibitory concentration (MIC) values and category interpretations, S, I, or R (sensitive, intermediate, or resistant).

#### **DEVICE COMPARISON:**

The BD Phoenix™ Automated Microbiology System demonstrated substantially equivalent performance when compared with the CLSI reference broth microdilution method. This premarket notification provides data for additional organism groups with Cefepime – 0.5-64 µg/mL and Ceftriaxone – 0.5-64 µg/mL and the BD Phoenix™ Automated Microbiology System.

#### **SUMMARY OF SUBSTANTIAL EQUIVALENCE TESTING:**

The BD Phoenix™ Automated Microbiology System has demonstrated substantially equivalent performance when compared to the CLSI reference broth microdilution method (AST panels prepared according to NCCLS M7). The system has been evaluated as defined in the FDA Draft guidance document, “Class II Special Controls Guidance Document: Antimicrobial Susceptibility Test (AST) Systems; Guidance for Industry and FDA,” February 5, 2003.

#### **Site Reproducibility**

Intra- and inter-site reproducibility of this antimicrobial agent in the BD Phoenix System was evaluated at three sites using a panel chosen isolates. Each site tested the isolates in triplicate on three different days using one lot of Phoenix panels containing the antimicrobial agents and associated reagents.

The results of the study demonstrate for each antimicrobial agent there was an overall intra-site reproducibility of greater than 90% and an overall inter-site reproducibility greater than 95% for the isolates tested.

## **Clinical Studies**

Clinical, stock and challenge isolates were tested across multiple geographically diverse sites across the United States to demonstrate the performance of the Phoenix antimicrobial susceptibility test with the Phoenix panel formats containing antimicrobial agents. Phoenix System results for Challenge set isolates were compared to the expected results. Phoenix System results for clinical isolates were compared to the results obtained from the CLSI reference broth microdilution method.

The performance of the Phoenix System was assessed by calculating Essential Agreement (EA) and Category Agreement (CA) to expected/reference results for all isolates tested. Essential Agreement (EA) occurs when the BD Phoenix™ Automated Microbiology System agrees exactly or within  $\pm$  one two-fold dilution to the reference result. Category Agreement (CA) occurs when the BD Phoenix™ Automated Microbiology System agrees with the reference method with respect to the FDA categorical interpretive criteria (susceptible, intermediate, and resistant).

Table 1 summarizes the performance for the isolates tested in this study.

**Table 1: Performance of BD Phoenix System by Drug**

<b>Antimicrobial</b>	<b>Concentration</b>	<b>EA (n)</b>	<b>EA (%)</b>	<b>CA (n)</b>	<b>CA (%)</b>
<b>Cefepime</b>	<b>0.5-64 µg/mL</b>	1789	95.2	1789	92.9
<b>Ceftriaxone</b>	<b>0.5-64 µg/mL</b>	1872	95.8	1872	90.9

## **Conclusions Drawn from Substantial Equivalence Studies**

The data collected from the substantial equivalence studies demonstrate that testing on the BD Phoenix™ Automated Microbiology System with this antimicrobial agent is substantially equivalent as outlined in the FDA draft guidance document, "Class II Special Controls Guidance Document: Antimicrobial Susceptibility Test (AST) Systems; Guidance for Industry and FDA," February 5, 2003. Technological characteristics of this system are substantially equivalent to those used in the VITEK® system, which received approval by the FDA under PMA number N50510 and BD Phoenix™ Automated Microbiology System with Gatifloxacin (K020321, May 23, 2002), Cefepime-0.5-64 µg/mL (K032675, March 1, 2004) and Ceftriaxone -0.5-64 µg/mL (K032655, October 6, 2003).



DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Food and Drug Administration  
2098 Gaither Road  
Rockville MD 20850

Ms. Monica E. Giguere  
Regulatory Affairs Specialist  
BD Diagnostic Systems  
7 Loveton Circle  
Sparks, MD 21152

APR 12 2006

Re: k060444/ S1  
Trade/Device Name: BD Phoenix™ Automated Microbiology System  
Cefepime (0.5—64 µg/mL) and Ceftriaxone (0.5—64 µg/mL) on  
Gram-negative ID/AST or AST  
Regulation Number: 21 CFR 866.1645  
Regulation Name: Fully Automated Short Term Incubation Cycle  
Antimicrobial Susceptibility Devices  
Regulatory Class: Class II  
Product Code: LON  
Dated: February 20, 2006  
Received: February 21, 2006

Dear Ms. Giguere:

We have reviewed your Section 510(k) premarket notification of intent to market the device referenced above and have determined the device is substantially equivalent (for the indications for use stated in the enclosure) to legally marketed predicate devices marketed in interstate commerce prior to May 28, 1976, the enactment date of the Medical Device Amendments, or to devices that have been reclassified in accordance with the provisions of the Federal Food, Drug, and Cosmetic Act (Act) that do not require approval of a premarket approval application (PMA). You may, therefore, market the device, subject to the general controls provisions of the Act. The general controls provisions of the Act include requirements for annual registration, listing of devices, good manufacturing practice, labeling, and prohibitions against misbranding and adulteration.

If your device is classified (see above) into either class II (Special Controls) or class III (PMA), it may be subject to such additional controls. Existing major regulations affecting your device can be found in Title 21, Code of Federal Regulations (CFR), Parts 800 to 895. In addition, FDA may publish further announcements concerning your device in the Federal Register.

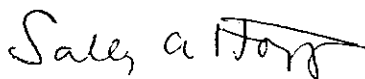
Please be advised that FDA's issuance of a substantial equivalence determination does not mean that FDA has made a determination that your device complies with other requirements of the Act or any Federal statutes and regulations administered by other Federal agencies. You must comply with all the Act's requirements, including, but not limited to: registration and listing (21 CFR Part 807); labeling (21 CFR Parts 801 and 809); and good manufacturing practice requirements as set forth in the quality systems (QS) regulation (21 CFR Part 820).

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This letter will allow you to begin marketing your device as described in your Section 510(k) premarket notification. The FDA finding of substantial equivalence of your device to a legally marketed predicate device results in a classification for your device and thus, permits your device to proceed to the market.

If you desire specific information about the application of labeling requirements to your device, or questions on the promotion and advertising of your device, please contact the Office of *In Vitro* Diagnostic Device Evaluation and Safety at (240)276-0484. Also, please note the regulation entitled, "Misbranding by reference to premarket notification" (21CFR Part 807.97). You may obtain other general information on your responsibilities under the Act from the Division of Small Manufacturers, International and Consumer Assistance at its toll-free number (800) 638-2041 or (301) 443-6597 or at its Internet address <http://www.fda.gov/cdrh/industry/support/index.html>

Sincerely yours,

A handwritten signature in black ink, appearing to read "Sally A. Hojvat".

Sally A. Hojvat, M.Sc., Ph.D.  
Director  
Division of Microbiology Devices  
Office of *In Vitro* Diagnostic Device  
Evaluation and Safety  
Center for Devices and  
Radiological Health

Enclosure

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510(k) Number: K060444/S1

Device Name: BD Phoenix™ Automated Microbiology System for use with the antimicrobial agent Cefepime (0.5-64 µg/mL) and Ceftriaxone (0.5-64 µg/mL) on Gram-negative ID/AST or AST only Phoenix panels with additional organism groups

Indications for Use:

The BD Phoenix™ Automated Microbiology System is intended for *in vitro* quantitative determination of antimicrobial susceptibility by minimal inhibitory concentration (MIC) of most Gram-negative aerobic and facultative anaerobic bacteria isolates from pure culture for *Enterobacteriaceae* and Non-*Enterobacteriaceae* and most Gram-positive bacteria isolates from pure culture belonging to the genera *Staphylococcus*, *Enterococcus*, and *Streptococcus*.

This premarket notification is for additional organism groups and BD Phoenix™ Automated Microbiology System with cefepime (0.5-64 µg/mL) and ceftriaxone (0.5-64 µg/mL) on Gram-negative ID/AST or AST only Phoenix panels.

**Cefepime** has been shown to be active *in vitro* against most strains of microorganisms listed below, as described in the FDA-approved package insert for this antimicrobial agent.

**Active In Vitro and in Clinical Infections Against:**

*Enterobacter* species

*Pseudomonas aeruginosa*

*Escherichia coli*

*Klebsiella pneumoniae*

**Active In Vitro Against:**

*Acinetobacter lwoffii*

*Pantoea agglomerans*

*Citrobacter koseri*

*Providencia rettgeri*

*Citrobacter freundii*

*Providencia stuartii*

*Hafnia alvei*

*Serratia marcescens*

*Klebsiella oxytoca*

*Morganella morganii*

*[Signature]*  
Division Sign-Off

Office of In Vitro Diagnostic Device  
Evaluation and Safety

510(k) \_\_\_\_\_

**Ceftriaxone** has been shown to be active *in vitro* against most strains of microorganisms listed below, as described in the FDA-approved package insert for this antimicrobial agent.

**Active In Vitro and in Clinical Infections Against:**

<i>Acinetobacter calcoaceticus</i>	<i>Klebsiella oxytoca</i>	<i>Serratia marcescens</i>
<i>Enterobacter aerogenes</i>	<i>Klebsiella pneumoniae</i>	<i>Pseudomonas aeruginosa</i>
<i>Enterobacter cloacae</i>	<i>Morganella morganii</i>	
<i>Escherichia coli</i>	<i>Proteus mirabilis</i>	

**Active In Vitro Against:**

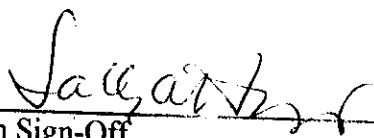
*Citrobacter koseri* (formerly *C. diversus*)  
*Citrobacter freundii*  
*Providencia* species (including *Providencia rettgeri*)  
*Salmonella* species  
*Shigella* species

Prescription Use ☒  
(Per 21 CFR 801.109)

☐ Over-the-Counter Use

(PLEASE DO NOT WRITE BELOW THIS LINE-CONTINUE ON ANOTHER PAGE IF NEEDED)

Concurrence of CDRH, Office of Device Evaluation (ODE)

  
Division Sign-Off

Office of In Vitro Diagnostic Device  
Evaluation and Safety

410(k) K060444/SC01